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MONTANA BIOECONOMICS STUDY:

A Contingent Valuation of Lake and Reservoir Fishing: Angler Attitudes and Economic Benefits

Prepared by:

Robert Brooks

Montana Department of Fish, Wildlife and Parks

December 1990

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required to produce the reports
in this series were provided by
the Federal Aid in Sport Fish
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EXECUTIVE SUMMARY

This report details the results of a lake and reservoir survey conducted by the Department of Fish, Wildlife and Parks, Fisheries Division during the fall of 1988. The survey was designed to collect information on lake and reservoir anglers' preferences regarding choice of water, their reasons for fishing, their attitudes and preferences regarding fisheries management programs and to measure the economic value of this resource using the Contingent Valuation Method.

The sample consisted of licensed anglers who had fished any of the twelve targeted lakes or reservoirs. Two thousand and eighty-one anglers were sent a questionnaire. The Dillman Total Design Method for mail surveys was utilized resulting in an overall response rate of seventy two percent (72%).

A summary of the socio-demographic findings reveals that 82% of the respondents were residents of Montana, 86% of the sample were male. Average age was 51 years and they had been fishing for 35 years. The mean income for residents was $27,000 and $33,500 for nonresidents. Resident anglers spent an average of $74.00 for their fishing trip and traveled 78 miles. Nonresidents spent considerably more, $340.00 and traveled an average of 300 miles.

The reasons for fishing varied but for the most part getting away from it all, to be with family or friends, enjoy the outdoors and fishing related reasons dominated the list. When asked why they chose this particular lake or reservoir to fish no one reason was foremost, although the reasons generally focused on fish related items and the fact the water was close to home.

To measure the economic benefits of lake and reservoir fishing the sampled anglers were asked to respond to three valuation questions. The question format presented the anglers with a yes-no situation on whether or not the trip to the targeted water was worth some predetermined bid amount. The answers to these three questions provided the data to estimate the net economic value of lake and reservoir fishing.

The first question asked the respondents to value their most recent fishing trip to the targeted water. The results show the net economic value for the complete sample was $166.00 per trip or $63.00 per day. This means anglers, on the average, were willing to spend $166.00 more per trip than their actual costs. Resident anglers were willing to spend $143.00 more and nonresidents $455.00.

The net economic value by lake varied from $110.00 for Holter reservoir to $294.00 for Lake Mary Ronan.

The next two questions presented the anglers with hypothetical situations of improved fishing (improved chance of catching large fish or catching more fish). Again, the value that the anglers placed on these two situations varied from water to water and did not show a consistent pattern from one situation to the other. This may be due to relatively small sample sizes on some waters. In some cases they valued the improved conditions higher than the current trip and lower in others. The anglers fishing Lake Mary Ronan and Clark Canyon valued the hypothetical improved conditions much higher than the current trip while anglers on Canyon Ferry and Georgetown did not.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....i

TABLE OF CONTENTS.....iii

LIST OF TABLES.....iv

CHAPTER I: INTRODUCTION.....1
Objectives.....1
Definition of Economic Benefits.....1
Contingent Valuation Method.....2

CHAPTER II: DATA.....3
Targeted Waters and Response Rates....3

CHAPTER III: DESCRIPTIVE STATISTICS.....4
Angler Characteristics.....4
Angling Experience.....5
Management Preferences.....12

CHAPTER IV: ANALYSIS AND ESTIMATION OF BENEFITS.....31
Lake and Reservoir Valuation.....31
Protest Bids and Outliers.....32
Model Specification.....32
Benefit Estimates.....33
Comparison of Results to Previous Studies.....36

REFERENCES.....37

APPENDIX A: Survey Instrument.....39

APPENDIX B: Response Rates by Lake.....40

APPENDIX C: Estimated Bivariate Models.....41

LIST OF TABLES

Table	Title	Page
1	Angler characteristics and trip information for resident and nonresident fishermen.....	5
2	Reasons for fishing and their importance.....	6
3a.	Reasons people chose to fish: Bear Paw Lake.....	7
3b.	" " " " " : Canyon Ferry.....	7
3c.	" " " " " : Clark Canyon.....	8
3d.	" " " " " : Cooney Res.....	8
3e.	" " " " " : Deadman's Res.....	9
3f.	" " " " " : Flathead.....	9
3g.	" " " " " : Georgetown Lake.....	10
3h.	" " " " " : Hauser Res.....	10
3i.	" " " " " : Holter Res.....	11
3j.	" " " " " : Lake Mary Ronan.....	11
3k.	" " " " " : Newlan Creek Res.....	12
4a.	Major problems associated with: Bear Paw Lake.....	13
4b.	" " " " : Canyon Ferry.....	13
4c.	" " " " : Clark Canyon.....	14
4d.	" " " " : Cooney Res.....	14
4e.	" " " " : Deadman's Res.....	15
4f.	" " " " : Flathead.....	15
4g.	" " " " : Georgetown Lake.....	16
4h.	" " " " : Hauser Res.....	16
4i.	" " " " : Holter Res.....	17
4j.	" " " " : Lake Mary Ronan.....	17
4k.	" " " " : Newlan Creek Res.....	18
5a.	Which of the following management programs do you favor for: Bear Paw Lake?.....	18
5b.	: Canyon Ferry?.....	19
5c.	: Clark Canyon?.....	19
5d.	: Cooney Res.?.....	19
5e.	: Deadman's Res.?.....	20
5f.	: Flathead?.....	20
5g.	: Georgetown lake?.....	20
5h.	: Hauser Res.?.....	21
5i.	: Holter Res.?.....	21
5j.	: Lake Mary Ronan?.....	21
5k.	: Newlan Creek Res.?.....	22

Table	Title	Page
6a.	What was the primary fish species you chose to fish for in :Bear Paw Lake?	22
6b.	:Canyon Ferry?	22
6c.	:Clark Canyon?	23
6d.	:Cooney Res?	23
6e.	:Deadman's Res.?	23
6f.	:Flathead?	24
6g.	:Georgetown Lake?	24
6h.	:Hauser Res?	24
6i.	:Holter Res?	25
6j.	:Lake Mary Ronan?	25
6k.	:Newlan Creek?	25
7.	If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Complete sample)	26
7a.	If more restrictive regulations ...? (Bear Paw Lake)	26
7b.	If more restrictive regulations ...? (Canyon Ferry)	27
7c.	If more restrictive regulations....? (Clark Canyon)	27
7d.	If more restrictive regulations....? (Cooney)	27
7e.	If more restrictive regulations....? (Deadman's Res.)	28
7f.	If more restrictive regulations....? (Flathead)	28
7g.	If more restrictive regulations....? (Georgetown)	28
7h.	If more restrictive regulations....? (Hauser Res.)	29
7i.	If more restrictive regulations....? (Holter Res.)	29
7j.	If more restrictive regulations....? (Lake Mary Ronan)	29
7k.	If more restrictive regulations....? (Newlan Creek)	30
8.	Net economic values for lake and reservoir fishing for the current trip - per trip and per day	33
9.	Net economic values for lake and reservoir fishing by individual waters for the current trip	34
10.	Net economic values for lake and reservoir fishing under improved conditions	35

CHAPTER I

INTRODUCTION

This report presents the results of the lake and reservoir angler survey conducted during the fall of 1988. The report provides estimates of net economic values for lake and reservoir fishing using the contingent valuation method (CVM) and details angler's attitudes about fishing as well as their preferences concerning management issues related to lake fishing.

Specifically, the objectives of the study are:

1. To estimate the current value of lake and reservoir fishing.

2. To estimate the change in value associated with improvements in fishing quality (i.e. bigger or more fish).

3. To assess lake anglers reasons for fishing, their demographic characteristics, and their preferences.

4. To determine lake anglers' views about fisheries management issues and problems on lakes and reservoirs.

Definition of Economic Benefits

The definition of economic benefits for a nonmarket resource like fishing is net willingness to pay. Net willingness to pay is the difference between the maximum amount an individual would be willing to pay before foregoing the use of a resource or commodity and the amount they must actually pay.

Net willingness to pay or net economic value (NEV) provides a measure of the value of a resource and is recommended by the U.S. Water Resources Council Principles and Guidelines (1983) as the preferred measure of economic value for both marketed and nonmarketed resources. Current literature recommends using the concept of net willingness to pay when performing benefit cost analysis (Sassone and Schaffer,1978). Net economic value provides a measure of the allocative impacts of policy choice. The estimates of value shown here can assist in making decisions concerning resource allocation and tradeoffs with marketed resources. This type of resource allocation process is based on economic efficiency; maximize the net present value of a resource from the standpoint of the whole society.

Net economic value differs from the expenditures for recreation in that expenditures define the relationship between the activity and the local and/or regional businesses. This spending is of importance to chambers of commerce and local communities since it provides jobs and tax revenues.

Contingent Valuation Method

The two methods approved by the U.S. Water Resources Council (1983) for valuing outdoor recreation are the travel cost method (TCM) and the contingent valuation method (CVM). The latter method is used in this study to estimate the net economic value for lake and reservoir fishing in Montana. A regional TCM application to Montana fisheries, for both streams and lakes, is described elsewhere (Duffield, Loomis and Brooks, 1987).

The CVM method is based on the notion that a realistic yet hypothetical market situation can be described to the respondents. Based on this information they will be able to express their valuation of the resource. Key features that need to be present for CVM to provide sound estimates of value are: 1) a description of the resource being valued; 2) the means of payment; 3) the value elicitation or "question format" (e.g. the means of extracting a response) procedure.

The description of the market should be clear and leave no doubt as to what is being valued. The means of payment must be realistic and emotionally neutral and appropriate for the situation. For this study the means of payment was an increase in trip costs associated with the fishing trip.

The value elicitation procedure used in this study is the closed-ended dichotomous choice approach (Bishop and Heberlein, 1979; Hanemann, 1984). This technique combines some of the better features of the open-ended and iterative bidding approaches. In the dichotomous choice the respondent is faced with a specific dollar bid and their response is a simple yes/no like in a real market. The dollar bids the respondents are asked to respond to cover a large range and are varied randomly across the sample.

While there are advantages and disadvantages to all the techniques, the dichotomous choice format provides good approximations to actual market transactions (Bishop and Heberlein, 1980; Welsh, 1986). The major disadvantage of a dichotomous CVM format is the complex analysis that is necessary when compared to the other two mentioned approaches. A more detailed comparison of these techniques is given by Duffield and Allen (1988).

CHAPTER II

DATA

The lake and reservoir questionnaire was a mail survey administered during October and November of 1988. The sample consisted of resident and non-resident anglers who purchased a Montana fishing license during 1988 and responded to the Statewide Fishing Use Mail Survey administered by Information Services of the Fisheries Division. Respondents indicated they had fished one of the targeted lakes or reservoirs. On those waters where small sample sizes were foreseen to be a problem, names and addresses were also collected on site from anglers willing to participate in the mail survey. In addition, anglers who had participated in previous surveys on selected lakes and reservoirs (Holter, Hauser, Flathead) were included in the sample.

Dillman's (1978) Total Design Method was used to conduct the mail survey. The initial mailing contained a cover letter, survey form and a self-addressed, stamped return envelope. One week later a postcard reminder was sent to everyone. If an angler had not responded by the end of the second week, he/she was sent a second copy of the survey.

Targeted Waters and Response Rates

Twelve lakes and reservoirs were chosen for this study by personnel in the Fisheries Division. These waters were felt to represent a cross section of the lakes and reservoirs in the state and would provide a good picture of lake and reservoir fishing. They were: Flathead Lake, Lake Koocanusa, Lake Mary Ronan, Clark Canyon Reservoir, Canyon Ferry Reservoir, Hauser Reservoir, Holter Reservoir, Newlan Creek Reservoir, Cooney Reservoir, Deadman's Basin Reservoir, Bear Paw Lake and Georgetown Lake. A total of 2081 anglers were sampled. Of the total surveys mailed; 1489 were completed, 30 were undeliverable and 28 responded they had not fished during 1988. The overall response rate was seventy two (72) percent; an excellent response rate for a mail survey. See Appendix C. for response rates by individual water.

CHAPTER III

DESCRIPTIVE STATISTICS

The survey contained a number of questions that describe the anglers who responded: where they're from, the reasons they fish, what type of fishing they enjoy, their attitudes about possible lake management issues, the economic value they place on the fishing experience, and some basic demographic information.

This chapter details the responses to the questions concerning the anglers' fishing and demographic information. The information is reported for the complete sample first and then broken down by individual waters.

Angler Characteristics

* Montana residents comprised 82 percent of the sample.

* 86 percent of the anglers interviewed were men.

* The median age was 51.

* They had been fishing 35 years (median) and fished 30 days per year (median).

* Only 15% of the sample belonged to a sport or conservation group

* 76 percent of the anglers rated trout/salmon fishing as either their favorite or one of their favorite activities.

* Of the anglers surveyed, 57 percent were employed full or part-time, 33 percent were retired and 2 percent were unemployed.

* Median household income was $22,500. Two percent of the sample had incomes over $75,000 and three percent made less than $5,000 per year. Median income for residents was $22,500 and $30,000 for nonresidents.

The following table details the important characteristics and differences of resident and nonresident anglers.

Table 1. Angler characteristics and trip information for resident and nonresident fishermen (Mean values).

Characteristic	Resident	Nonresident
Expenditures	$74.00	$340.00
Average miles traveled	78	304
Age	50	54
Education	Some college	Some college
Income	$26,980	$33,548
Average days per trip	2.47	3.50

The majority of the anglers were fishing from a boat (51%) while 27% fished from shore and the remaining 22% fished from both. They spent an average of five and half (5.5) hours per day fishing and caught an average of nine (9) fish of which they kept six (6). The anglers sampled reported that for a fish to be considered large it needed to be at least nineteen (19) inches long. They reportedly caught an average of two large fish on their most recent fishing trip.

Angling Experiences

There are many reasons why a person chooses to fish. The survey asked the anglers to respond to nine general reasons for fishing. Their responses provide insight into the types of fishing experiences they are looking for as well as an indication of their management preferences. Table 2 shows the relative importance of these nine reasons for fishing.

Table 2. Reasons for fishing and their importance (reported as percentages).

	Very Important	Important	Not very Important	Not at all Important
To catch wild trout/salmon	24	49	20	7
To catch many fish	8	30	47	15
To learn about fish	9	32	29	25
To get away from it all	53	37	7	2
To catch large fish	24	42	29	6
To be outdoors	64	34	1	.5
To catch fish to eat	22	40	27	11
To test my fishing skills	18	38	29	14
Companionship with family/friends	51	41	5	3

As this table illustrates, the most important reasons for going fishing are related to enjoying the outdoors, getting away from it all, or being with family/friends followed closely by reasons directly associated with fishing.

Asked to choose the three most important reasons of the nine, the anglers again picked to be outdoors, to get away from it all and to be with family and friends.

Anglers choose to fish a specific body of water for many reasons; it may be close to home, fishing has been good before, little angler pressure, or the expectation of catching a big fish. The following tables provide a summary of the importance of these reasons for the eleven sampled waters. Their responses provide valuable insight into the types of anglers fishing a particular water and illustrate the reasons they chose to fish a specific lake or reservoir.

Percentages across rows in the following tables may not add to 100% since a "not sure" category was summarized. Values may be missing in certain cell due to a lack of response in that category.

Table 3a. Reasons people chose to fish Bear Paw Lake (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	7	61	22	10
b.Fish somewhere new		13	26	59
c.Close to home	37	56	2	5
d.Scenery	5	46	27	22
e.Few Anglers	3	10	45	33
f.Boat ramps available	8	3	16	68
g.Public fishing access	12	51	20	17
h.Chance to catch lg fish	5	26	31	26
i.Specific fish species	18	40	25	18
j.Commercial services			14	81
k.Family recommended		11	14	73
l.Catch many fish	3	21	39	37
m.Get away from anglers	3	13	51	31

Table 3b. Reasons people chose to fish Canyon Ferry Lake (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	31	62	3	3
b.Fish somewhere new	1	8	25	62
c.Close to home	18	40	19	21
d.Scenery	6	32	29	31
e.Few Anglers	5	19	44	31
f.Boat ramps available	21	40	13	23
g.Public fishing access	42	51	4	4
h.Chance to catch lg fish	38	46	13	4
i.Specific fish species	28	42	15	12
j.Commercial services	8	20	29	38
k.Family recommended	1	20	28	41
l.Catch many fish	13	33	39	14
m.Get away from anglers	7	14	45	34

Table 3c. Reasons people chose to fish Clark Canyon Reservoir (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	39	45	6	9
b.Fish somewhere new	2	19	26	50
c.Close to home	19	24	21	34
d.Scenery	5	18	27	48
e.Few Anglers	2	20	45	30
f.Boat ramps available	22	38	10	27
g.Public fishing access	23	51	18	6
h.Chance to catch lg fish	42	42	12	3
i.Specific fish species	21	49	19	10
j.Commercial services	4	9	32	49
k.Family recommended	6	14	21	47
l.Catch many fish	10	38	29	19
m.Get away from anglers	4	22	43	28

Table 3d. Reasons people chose to fish Cooney Reservoir (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	27	54	10	6
b.Fish somewhere new	1	9	19	65
c.Close to home	52	41	4	2
d.Scenery	1	38	28	29
e.Few Anglers	7	13	37	33
f.Boat ramps available	24	37	13	23
g.Public fishing access	33	54	7	6
h.Chance to catch lg fish	13	34	37	16
i.Specific fish species	16	32	23	25
j.Commercial services	2	13	33	43
k.Family recommended	2	10	21	61
l.Catch many fish	13	36	23	28
m.Get away from anglers	13	10	32	43

Table 3e. Reasons people chose to fish Deadman's Reservoir (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	13	71	11	2
b.Fish somewhere new	2	16	20	61
c.Close to home	27	45	16	11
d.Scenery	2	8	24	63
e.Few Anglers	2	23	31	42
f.Boat ramps available	14	28	18	40
g.Public fishing access	30	44	11	15
h.Chance to catch lg fish	24	37	27	10
i.Specific fish species	10	41	24	24
j.Commercial services	2	6	13	71
k.Family recommended	2	8	21	67
l.Catch many fish	14	41	27	16
m.Get away from anglers	6	24	29	41

Table 3f. Reasons people chose to fish Flathead Lake (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	28	52	12	8
b.Fish somewhere new	2	9	19	68
c.Close to home	35	36	9	19
d.Scenery	13	51	23	13
e.Few Anglers	6	25	39	25
f.Boat ramps available	15	36	23	25
g.Public fishing access	17	37	17	27
h.Chance to catch lg fish	36	40	13	11
i.Specific fish species	37	40	10	12
j.Commercial services	3	10	19	64
k.Family recommended	2	8	13	73
l.Catch many fish	12	42	22	23
m.Get away from anglers	5	23	33	39

Table 3g. Reasons people chose to fish Georgetown Lake (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	27	52	14	4
b.Fish somewhere new	2	8	25	59
c.Close to home	21	41	16	22
d.Scenery	22	54	16	6
e.Few Anglers	3	24	51	18
f.Boat ramps available	12	23	24	41
g.Public fishing access	19	51	16	11
h.Chance to catch lg fish	19	40	31	6
i.Specific fish species	11	35	42	8
j.Commercial services	3	15	40	37
k.Family recommended	3	13	24	54
l.Catch many fish	9	38	37	15
m.Get away from anglers	11	14	45	29

Table 3h. Reasons people chose to fish Hauser Reservoir (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	32	54	9	4
b.Fish somewhere new	5	14	25	54
c.Close to home	19	40	22	18
d.Scenery	7	37	28	22
e.Few Anglers	5	14	46	30
f.Boat ramps available	22	31	17	27
g.Public fishing access	31	53	8	8
h.Chance to catch lg fish	30	46	17	7
i.Specific fish species	28	43	20	6
j.Commercial services	2	11	25	59
k.Family recommended	5	20	18	49
l.Catch many fish	10	41	30	17
m.Get away from anglers	9	17	45	27

Table 3i. Reasons people chose to fish Holter Reservoir (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	38	50	8	4
b.Fish somewhere new	1	9	19	65
c.Close to home	22	37	22	17
d.Scenery	20	45	22	13
e.Few Anglers	2	11	40	38
f.Boat ramps available	33	38	12	15
g.Public fishing access	39	42	9	8
h.Chance to catch lg fish	33	51	13	3
i.Specific fish species	28	43	19	8
j.Commercial services	3	20	35	37
k.Family recommended	4	14	17	59
l.Catch many fish	14	41	33	11
m.Get away from anglers	8	21	40	28

Table 3j. Reasons people chose to fish Lake Mary Ronan (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	47	44	5	4
b.Fish somewhere new		8	25	66
c.Close to home	19	29	22	29
d.Scenery	25	53	11	10
e.Few Anglers	5	20	40	30
f.Boat ramps available	15	45	15	24
g.Public fishing access	16	42	15	26
h.Chance to catch lg fish	17	34	30	18
i.Specific fish species	40	47	6	7
j.Commercial services	15	27	24	33
k.Family recommended	3	17	16	62
l.Catch many fish	17	33	31	18
m.Get away from anglers	6	17	33	38

Table 3k. Reasons people chose to fish Newlan Creek Reservoir (reported in percentage).

Reason	Very Important	Important	Not Very Important	Not at all Important
a.Good fishing before	24	46	17	11
b.Fish somewhere new	4	17	39	39
c.Close to home	23	29	21	27
d.Scenery	13	54	21	10
e.Few Anglers	6	23	45	23
f.Boat ramps available	4	20	27	49
g.Public fishing access	24	51	16	8
h.Chance to catch lg fish	12	40	38	10
i.Specific fish species	14	45	24	16
j.Commercial services	4	9	47	38
k.Family recommended		20	20	45
l.Catch many fish	11	15	53	21
m.Get away from anglers	7	28	39	20

Management Preferences

The management of the lakes and reservoirs throughout the state is a complex job. Fish managers are faced with problems that are biological as well as social e.g. crowding, conflicts between competing user groups, etc. To assist with the decisions that need to be made a number of questions were asked that address these issues. The results are shown in the following tables.

The items that anglers mentioned most frequently were water levels, too few fish or fish too small. While these were listed for most waters, users on Holter, Hauser, and Cooney also thought that there were too many nonfishing users.

4a. Major problems associated with Bear Paw Lake.

	Count	Percent
a.Too many nonfishing users	3	3 %
b.Too many anglers	8	9 %
c.Too many boats	1	1 %
d.Too few fish	28	30 %
e.Fish are too small	23	24 %
f.Water levels	13	14 %
g.Access not adequate	3	3 %
h.Poor fish habitat	2	2 %
i.Poor scenic quality	4	4 %
k.Water quality	3	3 %
l.Other	6	6 %

Table 4b. Major problems associated with Canyon Ferry Reservoir.

	Count	Percent
a.Too many nonfishing users	9	5 %
b.Too many anglers	2	1 %
c.Too many boats	6	3 %
d.Too few fish	30	15 %
e.Fish are too small	8	4 %
f.Water levels	77	39 %
g.Access not adequate	26	13 %
h.Poor fish habitat	3	2 %
i.Poor scenic quality	5	3 %
k.Water quality	20	10 %
l.Other	12	6 %

Table 4c. Major problems associated with Clark Canyon Reservoir.

	Count	Percent
a.Too many nonfishing users	5	3 %
b.Too many anglers	10	6 %
c.Too many boats	5	3 %
d.Too few fish	31	18 %
e.Fish are too small	12	7 %
f.Water levels	54	31 %
g.Access not adequate	25	14 %
h.Poor fish habitat	3	2 %
i.Poor scenic quality	15	9 %
j.Too much access	3	2 %
k.Water quality	5	3 %
l.Other	8	5 %

Table 4d. Major problems associated with Cooney Reservoir.

	Count	Percent
a.Too many nonfishing users	36	15 %
b.Too many anglers	4	2 %
c.Too many boats	38	16 %
d.Too few fish	33	14 %
e.Fish are too small	16	7 %
f.Water levels	48	20 %
g.Access not adequate	12	5 %
h.Poor fish habitat	8	3 %
i.Poor scenic quality	9	4 %
k.Water quality	19	8 %
l.Other	18	7 %

Table 4e. Major problems associated with Deadman's Reservoir.

	Count	Percent
a.Too many nonfishing users	8	5 %
b.Too many anglers	2	1 %
c.Too many boats	10	6 %
d.Too few fish	31	20 %
e.Fish are too small	6	4 %
f.Water levels	43	28 %
g.Access not adequate	20	13 %
h.Poor fish habitat	6	4 %
i.Poor scenic quality	21	13 %
j.Too much access	1	1 %
k.Water quality	2	1 %
l.Other	6	4 %

Table 4f. Major problems associated with Flathead Lake.

	Count	Percent
a.Too many nonfishing users	6	2 %
b.Too many anglers	4	1 %
c.Too many boats	2	1 %
d.Too few fish	86	31 %
e.Fish are too small	17	6 %
f.Water levels	60	22 %
g.Access not adequate	46	16 %
h.Poor fish habitat	14	5 %
i.Poor scenic quality	1	0 %
k.Water quality	19	7 %
l.Other	24	9 %

Table 4g. Major problems associated with Georgetown Lake.

	Count	Percent
a.Too many nonfishing users	11	6 %
b.Too many anglers	3	2 %
c.Too many boats	11	6 %
d.Too few fish	30	16 %
e.Fish are too small	36	20 %
f.Water levels	26	14 %
g.Access not adequate	10	5 %
h.Poor fish habitat	6	3 %
i.Poor scenic quality	2	1 %
j.Too much access	4	2 %
k.Water quality	17	9 %
l.Other	27	15 %

Table 4h. Major problems associated with Hauser Reservoir.

	Count	Percent
a.Too many nonfishing users	25	11 %
b.Too many anglers	21	9 %
c.Too many boats	32	14 %
d.Too few fish	36	15 %
e.Fish are too small	13	6 %
f.Water levels	17	7 %
g.Access not adequate	44	19 %
h.Poor fish habitat	3	1 %
i.Poor scenic quality	2	1 %
j.Too much access	2	1 %
k.Water quality	12	5 %
l.Other	26	11 %

Table 4i. Major problems associated with Holter Reservoir.

	Count	Percent
a.Too many nonfishing users	40	14 %
b.Too many anglers	19	7 %
c.Too many boats	31	11 %
d.Too few fish	50	17 %
e.Fish are too small	39	14 %
f.Water levels	8	3 %
g.Access not adequate	53	19 %
h.Poor fish habitat	1	0 %
i.Poor scenic quality	1	0 %
j.Too much access	2	1 %
k.Water quality	8	3 %
l.Other	34	12 %

Table 4j. Major problems associated with Lake Mary Ronan.

	Count	Percent
a.Too many nonfishing users	11	7 %
b.Too many anglers	12	7 %
c.Too many boats	7	4 %
d.Too few fish	19	12 %
e.Fish are too small	19	12 %
f.Water levels	36	22 %
g.Access not adequate	12	7 %
h.Poor fish habitat	9	6 %
i.Poor scenic quality	1	1 %
j.Too much access	5	3 %
k.Water quality	22	13 %
l.Other	10	6 %

Table 4k. Major problems associated with Newlan Creek Reservoir.

	Count	Percent
a.Too many nonfishing users	16	16 %
b.Too many anglers	3	3 %
c.Too many boats	10	10 %
d.Too few fish	24	23 %
e.Fish are too small	13	13 %
f.Water levels	17	17 %
g.Access not adequate	7	7 %
h.Poor fish habitat	2	2 %
i.Poor scenic quality	1	1 %
j.Too much access	2	2 %
k.Water quality	1	1 %
l.Other	7	7 %

The questions regarding fisheries management issues presented anglers with seven management options for the lake and reservoir that they fished. Based on their experience, they were asked to rank their first and second choices. Although a number did this, quite a few simply checked the item. The following tables show the number of times that an item was checked and its corresponding percent value.

As expected, there was not one management program that was an unanimous choice across all waters although the development of self-sustaining populations and water levels favorable to fish rated high on most waters.

Table 5a. Which of the following management programs do you favor for Bear Paw Lake?

	Count	Percent
a.Develop self-sustaining populations	13	36 %
b.Stock lakes with hatchery trout	12	33 %
c.Kill existing fish and restock	1	3 %
d.Maintain water levels favorable to fish	6	17 %
e.More restrictive fishing regulations	1	3 %
h.Other	3	8 %

Table 5b. Which of the following management programs do you favor for Canyon Ferry Reservoir?

	Count	Percent
a.Develop self-sustaining populations	31	35 %
b.Stock lakes with hatchery trout	16	18 %
c.Kill existing fish and restock	1	1 %
d.Maintain water levels favorable to fish	36	41 %
e.More restrictive fishing regulations	1	1 %
g.Improve fishing access	2	2 %
h.Other	1	1 %

Table 5c. Which of the following management programs do you favor for Clark Canyon Reservoir?

	Count	Percent
a.Develop self-sustaining populations	35	36 %
b.Stock lakes with hatchery trout	34	35 %
d.Maintain water levels favorable to fish	25	26 %
e.More restrictive fishing regulations	1	1 %
g.Improve fishing access	1	1 %
h.Other	1	1 %

Table 5d. Which of the following management programs do you favor for Cooney Reservoir?

	Count	Percent
a.Develop self-sustaining populations	21	25 %
b.Stock lakes with hatchery trout	24	29 %
c.Kill existing fish and restock	2	2 %
d.Maintain water levels favorable to fish	31	37 %
e.More restrictive fishing regulations	2	2 %
g.Improve fishing access	3	4 %

Table 5e. Which of the following management programs do you favor for Deadman's Reservoir?

	Count	Percent
a.Develop self-sustaining populations	8	17 %
b.Stock lakes with hatchery trout	10	21 %
d.Maintain water levels favorable to fish	28	60 %
f.More liberal fishing regulations	1	2 %

Table 5f. Which of the following management programs do you favor for Flathead Lake?

	Count	Percent
a.Develop self-sustaining populations	57	47 %
b.Stock lakes with hatchery trout	15	12 %
d.Maintain water levels favorable to fish	31	26 %
e.More restrictive fishing regulations	5	4 %
f.More liberal fishing regulations	1	1 %
g.Improve fishing access	6	5 %
h.Other	6	5 %

Table 5g. Which of the following management programs do you favor for Georgetown Lake?

	Count	Percent
a.Develop self-sustaining populations	33	37 %
b.Stock lakes with hatchery trout	25	28 %
c.Kill existing fish and restock	1	1 %
d.Maintain water levels favorable to fish	26	29 %
e.More restrictive fishing regulations	2	2 %
f.More liberal fishing regulations	2	2 %
g.Improve fishing access	1	1 %

Table 5h. Which of the following management programs do you favor for Hauser Reservoir?

	Count	Percent
a.Develop self-sustaining populations	55	38 %
b.Stock lakes with hatchery trout	37	26 %
d.Maintain water levels favorable to fish	30	21 %
e.More restrictive fishing regulations	6	4 %
f.More liberal fishing regulations	5	3 %
g.Improve fishing access	7	5 %
h.Other	3	2 %

Table 5i. Which of the following management programs do you favor for Holter Reservoir?

	Count	Percent
a.Develop self-sustaining populations	44	28 %
b.Stock lakes with hatchery trout	59	37 %
d.Maintain water levels favorable to fish	31	19 %
e.More restrictive fishing regulations	3	2 %
f.More liberal fishing regulations	5	3 %
g.Improve fishing access	9	6 %
h.Other	8	5 %

Table 5j. Which of the following management programs do you favor for Lake Mary Ronan?

	Count	Percent
a.Develop self-sustaining populations	34	41 %
b.Stock lakes with hatchery trout	22	27 %
c.Kill existing fish and restock	1	1 %
d.Maintain water levels favorable to fish	18	22 %
e.More restrictive fishing regulations	3	4 %
f.More liberal fishing regulations	1	1 %
g.Improve fishing access	1	1 %
h.Other	2	2 %

Table 5k. Which of the following management programs do you favor for Newlan Creek Reservoir?

	Count	Percent
a.Develop self-sustaining populations	12	29 %
b.Stock lakes with hatchery trout	7	17 %
c.Kill existing fish and restock	1	2 %
d.Maintain water levels favorable to fish	16	39 %
f.More liberal fishing regulations	3	7 %
g.Improve fishing access	2	5 %

The following tables show which species of fish the anglers were after when fishing these lakes and reservoirs. The respondents were asked to indicate their primary choice but in many cases they indicated more than one. This caused some accounting problems.

Table 6a. What was the primary fish species you chose to fish for in Bear Paw Lake?

Species	Count	Percent
a.Rainbow trout	14	34 %
b.Brown trout	1	2 %
c.Cutthroat trout	11	27 %
d.Brook trout	1	2 %
h.Other	2	5 %
i.Did not care	12	29 %

Table 6b. What was the primary fish species you chose to fish for in Canyon Ferry?

Species	Count	Percent
a.Rainbow trout	52	44 %
b.Brown trout	4	3 %
e.Lake/bull trout	3	3 %
g.Kokanee	1	1 %
h.Other	6	5 %
i.Did not care	51	44 %

Table 6c. What was the primary fish species you chose to fish for in Clark Canyon?

Species	Count	Percent
a.Rainbow trout	57	45 %
b.Brown trout	7	6 %
c.Cutthroat trout	1	1 %
e.Lake/bull trout	1	1 %
g.Kokanee	1	1 %
h.Other	6	5 %
i.Did not care	53	42 %

Table 6d. What was the primary fish species you chose to fish for in Cooney Reservoir?

Species	Count	Percent
a.Rainbow trout	46	45 %
b.Brown trout	2	2 %
g.Kokanee	1	1 %
h.Other	8	8 %
i.Did not care	45	44 %

Table 6e. What was the primary fish species you chose to fish for in Deadman's?

Species	Count	Percent
a.Rainbow trout	21	37 %
b.Brown trout	4	7 %
e.Lake/bull trout	2	4 %
g.Kokanee	3	5 %
h.Other	3	5 %
i.Did not care	24	42 %

Table 6f. What was the primary fish species you chose to fish for in Flathead?

Species	Count	Percent
a.Rainbow trout	5	4 %
b.Brown trout	1	1 %
c.Cutthroat trout	19	14 %
d.Brook trout	1	1 %
e.Lake/bull trout	85	61 %
g.Kokanee	13	9 %
h.Other	7	5 %
i.Did not care	9	6 %

Table 6g. What was the primary fish species you chose to fish for in Georgetown Lake?

Species	Count	Percent
a.Rainbow trout	49	46 %
b.Brown trout	3	3 %
c.Cutthroat trout	3	3 %
d.Brook trout	2	2 %
e.Lake/bull trout	1	1 %
g.Kokanee	11	10 %
h.Other	3	3 %
i.Did not care	34	32 %

Table 6h. What was the primary fish species you chose to fish for in Hauser Reservoir?

Species	Count	Percent
a.Rainbow trout	45	25 %
b.Brown trout	3	2 %
e.Lake/bull trout	2	1 %
g.Kokanee	76	43 %
h.Other	9	5 %
i.Did not care	43	24 %

Table 6i. What was the primary fish species you chose to fish for in Holter Reservoir?

Species	Count	Percent
a.Rainbow trout	80	43 %
c.Cutthroat trout	1	1 %
e.Lake/bull trout	2	1 %
g.Kokanee	5	3 %
h.Other	30	16 %
i.Did not care	66	36 %

Table 6j. What was the primary fish species you chose to fish for in Lake Mary Ronan?

Species	Count	Percent
a.Rainbow trout	29	27 %
c.Cutthroat trout	13	12 %
g.Kokanee	46	42 %
h.Other	4	4 %
i.Did not care	17	16 %

Table 6k. What was the primary fish species you chose to fish for in Newlan Creek Reservoir?

Species	Count	Percent
a.Rainbow trout	17	30 %
b.Brown trout	3	5 %
c.Cutthroat trout	17	30 %
e.Lake/bull trout	1	2 %
i.Did not care	18	32 %

Although the majority of anglers would like the opportunity to catch large trout/salmon, in many cases they are unwilling to accept more restrictive management regulations that would provide the larger fish. Anglers were asked "if more restrictive regulations were needed to increase the number of large trout in a lake", which two would they prefer. Though the question was worded to mean any lake, the framework of the questionnaire would lead the respondent to answer based on the lake or reservoir they had fished on their most current trip. Table 7 presents the answers for the complete sample while Tables 7a - 7k give the answers for the individual waters.

Table 7. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Complete sample)

	Count	Percent
a.Shorten season length	156	19 %
b.Catch and release all trout	54	7 %
c.Keep only small trout	21	3 %
d.Keep only one large trout	216	27 %
e.Reduce total limit	141	17 %
f.Slot limit	220	27 %

Table 7a. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Bear Paw)

	Count	Percent
a.Shorten season length	3	10 %
b.Catch and release all trout	2	7 %
c.Keep only small trout	1	3 %
d.Keep only one large trout	7	23 %
e.Reduce total limit	10	33 %
f.Slot limit	7	23 %

Table 7b. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Canyon Ferry)

	Count	Percent
a.Shorten season length	20	29 %
b.Catch and release all trout	2	3 %
c.Keep only small trout	2	3 %
d.Keep only one large trout	18	26 %
e.Reduce total limit	13	19 %
f.Slot limit	15	21 %

Table 7c. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Clark Canyon)

	Count	Percent
a.Shorten season length	28	33 %
b.Catch and release all trout	4	5 %
d.Keep only one large trout	21	24 %
e.Reduce total limit	12	14 %
f.Slot limit	21	24 %

Table 7d. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Cooney Reservoir)

	Count	Percent
a.Shorten season length	14	22 %
b.Catch and release all trout	3	5 %
c.Keep only small trout	1	2 %
d.Keep only one large trout	12	19 %
e.Reduce total limit	9	14 %
f.Slot limit	25	39 %

Table 7e. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Deadman's)

	Count	Percent
a.Shorten season length	7	18 %
b.Catch and release all trout	1	3 %
c.Keep only small trout	2	5 %
d.Keep only one large trout	11	29 %
e.Reduce total limit	6	16 %
f.Slot limit	11	29 %

Table 7f. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Flathead Lake)

	Count	Percent
a.Shorten season length	10	9 %
b.Catch and release all trout	15	14 %
c.Keep only small trout	6	6 %
d.Keep only one large trout	27	25 %
e.Reduce total limit	12	11 %
f.Slot limit	37	35 %

Table 7g. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Georgetown Lake)

	Count	Percent
a.Shorten season length	16	21 %
b.Catch and release all trout	10	13 %
c.Keep only small trout	1	1 %
d.Keep only one large trout	19	25 %
e.Reduce total limit	9	12 %
f.Slot limit	21	28 %

Table 7h. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Hauser Reservoir)

	Count	Percent
a.Shorten season length	14	12 %
b.Catch and release all trout	4	3 %
c.Keep only small trout	4	3 %
d.Keep only one large trout	37	32 %
e.Reduce total limit	26	23 %
f.Slot limit	30	26 %

Table 7i. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Holter Reservoir)

	Count	Percent
a.Shorten season length	28	24 %
b.Catch and release all trout	3	3 %
c.Keep only small trout	2	2 %
d.Keep only one large trout	29	25 %
e.Reduce total limit	25	21 %
f.Slot limit	30	26 %

Table 7j. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Lake Mary Ronan)

	Count	Percent
a.Shorten season length	10	15 %
b.Catch and release all trout	10	15 %
d.Keep only one large trout	21	32 %
e.Reduce total limit	11	17 %
f.Slot limit	14	21 %

Table 7k. If more restrictive regulations were needed to increase large trout populations in a lake, which would you prefer? (Newlan Creek Reservoir)

	Count	Percent
a.Shorten season length	6	15 %
c.Keep only small trout	2	5 %
d.Keep only one large trout	14	36 %
e.Reduce total limit	8	21 %
f.Slot limit	9	23 %

CHAPTER IV

LAKE AND RESERVOIR VALUATION ANALYSIS

The lake and reservoir angler survey contained a section which asked anglers to provide information on their trip costs, distance traveled, and the value of the fishing trip. To estimate the value of their fishing trip (net willingness to pay) for their most recent trip, the anglers were asked to respond to a dichotomous choice contingent valuation question. They were first asked how much they had spent on gas, food, lodging, etc for this trip. The question hopefully provided a reference for their response to the CVM questions. They were then asked:

> Suppose that your share of the expenses to visit (Lake name) increased, would you still have made the trip if they had been $ xxxx more?

The angler was given only the opportunity to respond yes or no to this question. The dollar amounts that were written in varied from $5.00 to $2000.00 and were randomly distributed across the sample.

In addition to the current trip question, two CVM questions were asked that presented hypothetical situations based on the angler's current trip. The questions presented the anglers with situations of improved quality, either in their chances of catching a large fish or the number of fish they could catch.

> Imagine that everything about this last trip was the same, except that your chance of catching a large trout/salmon was **twice** as great and your trip costs were $xxxx more than your actual costs. Would you still have made the trip under these circumstances.

> If you caught at least one trout/salmon, imagine that everything about this last trip was the same, except that you caught **twice** as many trout/salmon as you actually did and that your trip costs were $xxxxx more than your actual costs. Would you still have made the trip under these circumstances?

These two questions determine anglers willingness to pay for improved conditions - either larger fish or more fish. One shortcoming of the question format is that it does not explain

that there may be some regulatory constraints necessary in terms of management to reach these goals.

Protest Bids and Outliers

There are two types of responses to the CVM questions that require scrutiny to insure that the benefit estimates are not biased upward. The first type is referred to as protest responses. The Water Resources Council recommends asking a followup question to determine if any protest responses have occurred. The followup question in the lake and reservoir survey was: "If no, would you have made the trip if your share of the expenses had been only $1.00 more?" If the angler responded no to this question, he/she was asked to explain why. The responses that were considered to be protests to the market situation included:

* Anglers saying they did not understand the question.
* Those anglers that said they opposed any increase in taxes or fees.

The second type of response that was considered for exclusion were those anglers who said they would pay the stated bid amount but based on their income level would not be able to.

The respondents' ability to pay was calculated as the percentage of their income that each angler was willing to spend on lake and reservoir fishing:

Percent = (Actual out of pocket costs + bid amount) X (the number of trips the angler said he would take) / income.

If Percent was greater than one, those persons were excluded from the analysis since they obviously could not afford to pay the stated bid amount. This resulted in one percent of the sample being excluded.

Model Specification

The specification of a model that explains an angler's response to a CVM question is based on economic theory. For purposes of this study, a model is used which relates the log of the odds of answering yes to the log of the bid amount. This type of model is called a logit model (Bishop and Heberlein, 1979). Past studies have shown that a logit model with logged bid values provides a better fit to dichotomous choice CVM data than a linear specification. This model is shown in equation 1.

$$(1) \quad \ln(p/1-p) = Bo - B1 \ln(bid)$$

Benefit Estimates

The net economic values associated with lake and reservoir fishing for the complete sample are presented in Table 8. The method used to calculate these net economic values is MEAN-LOGIT. The measure of net economic value used is the mathematical expectation or the mean of maximum willingness to pay. The probability of a yes response is plotted against the bid level. At low bid levels the acceptance or yes response is high. As the bid amount increases, acceptance decreases and asymptotically approaches zero at the higher bid levels. Integrating the area under the curve from a bid level of zero to some upper limit provides an estimate of the mean (MEAN-LOGIT). The upper level of integration in this study was $2000. In the tables this truncated mean measure of net economic benefits is designated as "MEAN-LOGIT". The estimated equations used to calculate the means reported here are shown in Appendix C. The t statistics associated with the bivariate equations are significant at the 95% level. The goodness of fit statistics, Chi-squared, related to the equations showed good fit for the disaggregated models, i.e. resident, nonresident, individual lakes, but not for the complete sample model.

Table 8. Net economic values for lake and reservoir fishing for the current trip - per trip and per day. (Complete sample)

PER TRIP VALUES:

	State	Residents	Nonresidents
Mean-Logit	$166.26	$143.00	$455.00

PER DAY VALUES:

	State	Residents	Nonresidents
Mean-Logit	$ 63.85	$57.89	$130.00

As Table 8 shows, there is considerable difference between the resident and nonresident values. This is consistent with the results of other studies and points out on average nonresidents place a higher value on their fishing experience than do residents.

Previous studies have also reported net economic values based on the median. Generally these values are lower than the estimates using the mean values. The median shows the amount that at least half the sample would be willing to pay but overlooks those respondents that are willing to pay substantially more than the median. To estimate the total benefits of lake and reservoir fishing, the MEAN-LOGIT estimates are the correct measure. See Duffield and Patterson (1991) for a discussion of the choice of welfare measures.

Table 9. Net economic values for lake and reservoir fishing by individual waters for the current trip.

Lakename	MEAN-LOGIT Per Trip	MEAN-LOGIT Per Day	(n)
Canyon Ferry	$ 218.35	$ 60.56	88
Clark Canyon *	217.84	84.00	65
Cooney Res.**	78.18	43.44	67
Flathead	167.36	72.77	73
Georgetown	219.20	78.29	67
Hauser Res.	176.70	59.70	116
Holter Res.	110.38	42.45	127
Lake Mary Ronan	294.89	55.64	75

*The upper level of integration for Clark Canyon was $2000 even though the highest observed bid was $1000. Truncated at $1000 the NEV is $183.00
** The upper level of integration for Cooney was $500.00.
Bear Paw, Deadman's and Newlan Cr. were not included due to small sample sizes.

Comparison of the reported benefit estimates between waters should be done with caution. Confidence intervals have not been calculated for these estimates and there may not be any statistical differences between waters due to sample size differences.

Analysis of Values for Improved Conditions

An objective of the lake and reservoir angler survey was to estimate the net economic values for the current trip under hypothetically improved conditions. The improved conditions were 1) doubling an anglers chances of catching a large fish and 2) catching twice as many trout/salmon as they actually did.

The benefit estimates for the complete sample (presented in Table 10 - Section A) from these two economic questions indicated that the sampled anglers valued the improved conditions higher than the current trip. These results are not surprising when one considers that catching large trout/salmon and catching many fish rated fairly high with anglers in terms of reasons for fishing a particular reservoir.

The benefit estimates for the two improved condition situations are shown in Section B, Table 10. The results vary considerably from lake to lake with respondents from Clark Canyon and Lake Mary Ronan valuing the improved conditions the most. Those anglers fishing Hauser and Holter also value the improved conditions higher than their current trip. Canyon Ferry anglers were the only respondents that consistently valued the improved conditions lower that their current trip.

Table 10. Net economic values per trip associated with improved conditions - lake and reservoir fishing.

Section A

Complete Sample	MEAN-LOGIT
Current Trip	$166.00
Chance to catch large trout	$194.00
Catch more fish	$208.00

Section B

	MEAN-LOGIT		
Lakename	Current trip	Chance to catch large trout	Catch more fish
Canyon Ferry	$218.35	$ 103.00	$ 146.15
Clark Canyon	217.84	419.75	542.64
Cooney Res.	78.18	80.20	78.97
Flathead	167.36	138.78	172.07
Georgetown	219.20	194.41	159.93
Hauser	176.70	211.24	273.10
Holter	110.38	195.35	116.76
Lake Mary Ronan	294.89	400.38	367.55

* Bear Paw, Deadman's and Newlan Creek were not included due to insufficient sample sizes.

Comparison of Results to Previous Studies

A 1987 travel cost model study of Montana's lake and stream fishermen provides the most current comparison for this study's results. The TCM study by Duffield, Loomis and Brooks (1987) found that a lake fishing trip in Montana had an average net economic value of $88.00 per trip or $70.00 per day compared to a net economic value of $166.00 per trip or $63.00 per day for this CVM study. A major difference between the studies was the average (mean) number of days fished per trip. Mean days fished for the TCM study was 1.17 while the mean number of days fished for this study was 2.6.

A study by Brown, et.al. (1987) using the information from the 1980 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation estimated the net economic value for a day of trout fishing at $12.00 per day in 1980 dollars.

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APPENDIX A.

Survey Instrument

FLATHEAD LAKE ANGLER SURVEY

SUMMER 1988

Thanks again. If you would like to receive a copy of the survey results, please write "Results requested" and your address on the back of the return envelope (not on this questionnaire).

I. First, we have some general questions about your fishing.

1. How many years have you been fishing? _____ Years

2. About how many days a year do you fish for trout / salmon?
_____ Days

3. How would you rate trout/salmon fishing compared to other outdoor recreation activities you do? (please check one)

_____ It's my favorite outdoor recreation activity

_____ It's one of my favorite outdoor recreation activities

_____ It's just one of several outdoor recreation activities that I do

_____ I prefer to participate in other outdoor recreation activities

4. About what percent of your fishing time do you spend at each

Large lakes	_____ %
Small Lakes	_____ %
Large rivers	_____ %
Small rivers	_____ %
Creeks	_____ %
Spring creeks	_____ %
Total	100

II. The next few questions ask about your MOST RECENT LAKE FISHING TRIP to Flathead Lake and your evaluation of the fishing there.

1. Approximate date(s) of this last trip:_____
(a trip could be anything from an hour to several or more days)

2. How many days did you fish Flathead Lake on this trip?

_____ Days

3. About how many hours per day did you fish?

_____ Hours per day

4. What type of fishing equipment did you use? (check all types used)

_____ Bait

_____ Lures

_____ Flies (Did you tie your own? _____ yes _____ no)

5. Would you estimate the current market value of the equipment you have purchased over the years primarily for Lake fishing (ie. boat, motor, trailer, fishing gear, ect.)

_____ $ Total

6. About how many trout/salmon did you catch on this most recent trip?

_____Trout/Salmon caught

7. How many trout/salmon did you keep?

_____ Trout/salmon kept

8. Did you use a fishing guide or outfitter on Flathead Lake?

_____ Yes _____ No

9. Did you fish from shore, from a boat, or both?

_____ Shore _____ Boat _____ Both

10. How many other anglers were in your party?

_____ # of other anglers that came with me

11. People fish for many reasons. We'd like to know some of the general reasons you fish to help us understand different types of anglers and their preferences.

Following is a list of possible reasons for fishing. Please check the box that says whether that reason was very important, important, not very important, not at all important, or not sure.

	Very Important	Important	Not very Important	Not at all Important	Not Sure
a. To catch wild trout/salmon	☐	☐	☐	☐	☐
b. To catch many fish	☐	☐	☐	☐	☐
c. To learn more about fish	☐	☐	☐	☐	☐
d. To get away from it all	☐	☐	☐	☐	☐
e. To catch large fish	☐	☐	☐	☐	☐
f. To be outdoors	☐	☐	☐	☐	☐
g. To catch fish to eat	☐	☐	☐	☐	☐
h. To test my fishing skills	☐	☐	☐	☐	☐
i. Companionship with family/friends	☐	☐	☐	☐	☐

12. Please look back over this list and circle the **THREE** most important reasons

13. Was this water the main (or only) lake you fished on this trip, or did you fish other waters? (Please check one)

_____ This lake was the main (or only) water I fished on this trip.

_____ Fishing at other waters was just as important as fishing this lake.

_____ Fishing other waters was more important than fishing this lake this trip.

14. Was fishing the main purpose of your trip when you fished this lake or did you make the trip for other reasons such as business or a family vacation?

_____ Fishing was the main purpose of this trip

_____ Fishing was one of several reasons for making the trip

_____ The main purpose of this trip was not to fish, but for other reasons.

15. Was this your first visit to Flathead Lake?

_____ Yes

_____ No. If no, how many years have your been fishing Flathead Lake?

_____ Years

16. How many separate trips did you make from your home to Flathead Lake this year?

_____ Separate trips from home this year

17. Based on your fishing experience do you think any of the following are major problems on this water?

_____ Too many nonfishing users
_____ Too many anglers
_____ Too many boats
_____ Too few fish
_____ Fish are too small
_____ Water levels
_____ Access not adequate
_____ Poor fish habitat
_____ Poor scenic quality
_____ Too much access
_____ Water quality
_____ Other: _____

_____

18. How did the number of recreationists present affect your enjoyment of this trip?

_____ Lake was too crowded

_____ No effect

_____ Presence of others added to my enjoyment

19. Please indicate the reasons you chose to fish Flathead Lake this trip. The following list gives some of the possible reasons. Indicate whether the reason was very important, important, not very important, not at all important, or not sure.

	Very Important	Important	Not very Important	Not at all Important	Not Sure
a. I've had good fishing here before	☐	☐	☐	☐	☐
b. To fish somewhere new	☐	☐	☐	☐	☐
c. It's close to home	☐	☐	☐	☐	☐
d. Because of the scenery	☐	☐	☐	☐	☐
e. There are few anglers here	☐	☐	☐	☐	☐
f. Boat ramps available	☐	☐	☐	☐	☐
g. Available public fishing access	☐	☐	☐	☐	☐
h. Chance to catch large fish	☐	☐	☐	☐	☐
i. Presence of specific fish species	☐	☐	☐	☐	☐
j. Commercial services available	☐	☐	☐	☐	☐
k. Heard about it from friends / media	☐	☐	☐	☐	☐
l. Chance to catch many fish	☐	☐	☐	☐	☐
m. To get away from other anglers	☐	☐	☐	☐	☐

20. Please look back over this list and circle the letters of the **THREE** most important reasons you chose to fish Flathead Lake.

21. Do you plan to continue fishing Flathead Lake?

_____ Yes _____ No

22. If yes, about how frequently do you plan to fish Flathead Lake? (check one)

_____ As frequently as I do now

_____ More frequently than I do now

_____ Less frequently than I do now

_____ I'm not sure

23. How does Flathead Lake compare to other lakes in Montana? (please check one)

_____ It's my favorite place to fish

_____ It's one of my favorite places to fish

_____ It's one of many places where I fish

_____ I prefer to fish other places

24. If you could not have fished Flathead Lake, where might you have fished instead?

_____ Name of lake

25. About how far is it from your home to this alternative fishing location?

_____ Miles

26. How does it compare to fishing the Flathead Lake?

_____ Flathead Lake is much better

_____ Flathead Lake is better

_____ Same

_____ Flathead Lake is worse

_____ Flathead Lake is much worse

III. The next few questions will help us to understand the value people place on fishing Flathead Lake.

We realize you aren't used to considering fishing this way, but please think about it and give us your best estimate!

1. About how far is it from your home to where you fished the Flathead Lake this trip?

_____ Miles (one-way)

2. How long did it take to travel from your home to the Flathead Lake?

_____ Hours (include any stops made en route)

3. If you drove, how many anglers were in the vehicle with you?

_____ Other anglers

4. About how much did you personally spend on this trip: Include expenses such as gas and oil, food and beverages, any lodging or camping fees, car or boat rentals, airfares, equipment purchased just for this trip, fishing access fees, and other trip expenses. If you can't recall the exact amount, please give your best estimate.

_____ Total amount I spent on this trip

5. Suppose that your share of the expenses to visit Flathead Lake increased, would you still have made the trip if they had been _____ more?

_____ Yes, I would still have made the trip.

_____ No. If no, would you have made the trip if your share of the expenses had been only **$ 1.00** more?

_____ Yes

_____ No. If no, could you briefly explain why not.

_____

_____

6. What was the primary fish species you chose this lake for?

_____ rainbow / brown / cutthroat / brook trout (circle appropriate species)

_____ lake / bull trout

_____ kokanne salmon

_____ other _____

_____ didn't care

7. For the <u>species</u> you primarily targeted on this trip, what do you consider to be a large fish?

_____ inches

8. How many large trout/salmon did you catch on this trip to Flathead Lake?

_____ Large trout caught

9 Imagine that everything about this last trip was the same, except that your chance of catching a large trout/salmon was <u>twice</u> as great AND your trip cost were _____ more than your actual cost Would you still have made the trip under these circumstances? (Please check one)

_____ Yes, I would still have made the trip

_____ No. If no, would you have made the trip if your share of the expenses had been only **$ 1.00** more?

_____ Yes

_____ No. If no, could you briefly explain why not?

_____

_____

10. If you caught at least one trout/slamon, imagine that everything about this last trip was the same, except that you caught <u>twice</u> as many trout/salmon as you actually did AND that your trip cost were _____ more than your actual cost. Would you still have made the trip under these circumstances?

_____ Yes, I would still have made the trip

_____ No. If no, would you have made the trip if your share of the expenses had been only **$1.00** more?

_____ Yes

_____ No. If no, could you briefly explain why not?

_____

_____

IV. The next few questions ask your opinion on different statewide lake fisheries management options.

1. In general, which two of the following management programs do you favor the most for managing Flathead Lake? (Please rank your top choice number 1 and your second choice number 2)

_____ Develop self sustaining populations

_____ Stocking lakes with hatchery trout

_____ Kill off existing fish and restock

_____ Maintaining water levels favorable to fish

_____ More restrictive fishing regulations

_____ More liberal fishing regulations

_____ Improving fishing access

_____ Other _____

2. In general, do you think Montana's trout lakes should be managed to provide:

_____ Many fish, smaller average size, liberal limits

_____ Fewer fish, larger average size, more restrictive limits

_____ No opinion

3. Do you think a small number of lakes with high potential should be managed specifically to produce large sized trout?

_____ Yes

_____ No

_____ No opinion

4. If more restrictive regulations were needed to increase the number of large trout in a lake, which two of the following regulations would you prefer? (Please rank your top choice number 1 and your second choice number 2)

_____ Shorten season length

_____ Catch and release all trout

_____ Keep only small trout

_____ Keep only one large trout

_____ Reduce total limit

_____ Slot limit (Catch and keep trout under a minimum size and one trout over a maximum size, release all others)

V. These last few questions will help us understand your responses by knowing some basic information about you.

1. Where are you from? City:_____ State: _____

2. What is your age _____ Years

3. Are you _____ Male _____ Female

4. Are you a member of any fishing or conservation organization?

____Yes _____ No

5. If, so which ones?

6. What is the highest year of formal education you completed?

_____ Some grade school _____ Some college

_____ Finished grade school _____ Finished college

_____ Finished junior high school _____ Some postgraduate work

_____ Finished high school _____ Finished postgraduate

7. If you had not gone fishing this trip, would you have been working instead?

_____ Yes _____ No

8. During the fishing season this year, were you : (check one)

_____ Employed full time _____ Retired

_____ Employed part time _____ Homemaker

_____ Unemployed _____ Other: _____

9. Please check your household's income before taxes last year:

_____ Under 5,000	_____ 20,000- 24,999	_____ 40,000-49,999
_____ 5,000-9,999	_____ 25,000-29,999	_____ 50,000-74,999
_____ 10,000-14,999	_____ 30,000-34,999	_____ 75,000-100,000
_____ 15,000-19,999	_____ 35,000-39,999	_____ over 100,000

Thank you for your help. Is there anything else you'd like to tell us about fishing [illegible] lake? We would appreciate your comments on the next page.

APPENDIX B.

Response Rate by Individual Water:

Lakename	Questionnaires Sent	Questionnaires Received
Canyon Ferry	130	118
Lake Mary Ronan	170	110
Newlan Creek	94	62
Holter Res.	250	186
Georgetown Lake	156	109
Clark Canyon	208	133
Hauser Res.	250	183
Flathead Lake	204	152
Cooney Res.	166	100
Deadman's Res.	92	50
Bear Paw	60	42
TOTAL	2081	1489

Overall response rate = 72%
Undeliverables = 30
Did not fish = 28

APPENDIX C.

Estimated Bivariate Model Equations

ESTIMATED BIVARIATE MODELS - COMPLETE SAMPLE

Question	Constant	Log (Bid)	N
Current Trip:			
Complete Sample	3.6593 (11.51)	-.9825 (-14.09)	769
Residents	3.6621 (10.56)	-1.027 (-13.17)	682
Nonresidents	4.4709 (4.46)	-.8834 (-4.60)	87
Large Fish:			
Complete Sample	3.3354 (10.68)	-.8949 (-13.36)	750
More Fish:			
Complete Sample	2.5622 (9.03)	-.7502 (-12.22)	751

T statistics are shown in parenthesis.

ESTIMATED BIVARIATE MODELS - BY LAKENAME

Current Trip:

Lakename	Constant	Log (Bid)	N
Hauser	3.2142 (4.48)	-.8956 (-5.55)	116
Holter	5.0393 (4.47)	-1.3245 (-5.84)	127
Lake Mary Ronan	4.4771 (4.16)	-.9867 (-4.55)	75
Georgetown	3.0506 (2.77)	-.8184 (-3.64)	67
Canyon Ferry	2.7348 (3.40)	-.7676 (-4.48)	88
Clark Canyon	5.1631 (4.09)	-1.1738 (-4.47)	65
Cooney Res.	5.2731 (3.54)	-1.4260 (-4.11)	67
Flathead	2.8640 (3.24)	-.8480 (-4.38)	73

T statistics are shown in parenthesis.

Large Trout:

Lakename	Constant	Log (Bid)	N
Hauser	3.3114 (3.99)	-.8702 (-5.18)	110
Holter	2.6056 (3.70)	-.7701 (-5.00)	119
Lake Mary Ronan	3.7443 (3.35)	-.7987 (-3.76)	71
Georgetown	2.4134 (2.27)	-.7390 (-3.39)	64
Canyon Ferry	4.6471 (4.30)	-1.276 (-4.98)	88
Clark Canyon	2.8863 (3.01)	-.6530 (-3.47)	59
Cooney Res.	5.7520 (3.73)	-1.517 (-4.27)	68
Flathead	3.3749 (3.46)	-.9748 (-4.47)	75

T statistics are shown in parenthesis

More Trout:

Lakename	Constant	Log (Bid)	N
Hauser	.9034 (1.32)	-.4279 (-3.14)	113
Holter	3.1726 (3.87)	-.9782 (-3.96)	130
Lake Mary Ronan	3.1627 (2.91)	-.7257 (-3.51)	70
Georgetown	4.6388 (3.98)	-1.161 (-4.52)	66
Canyon Ferry	2.5523 (2.55)	-.8230 (-3.92)	84
Clark Canyon	1.6546 (2.17)	-.4053 (-2.66)	59
Cooney Res.	3.9485 (3.44)	-1.141 (-4.21)	71
Flathead	2.0457 (2.24)	-.7030 (-3.48)	74

T statistics are shown in parenthesis